

**Module Description**


---

# Integrated Automation

**General Information**
**Number of ECTS Credits**

3

**Abbreviation**

TSM\_IntAuto

**Version**

2.12.2016

**Responsible of module**

Christian Bernes, FHO

**Language**

	Lausanne	Bern	Zürich
Instruction	<input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input checked="" type="checkbox"/> E
Documentation	<input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input checked="" type="checkbox"/> E
Examination	<input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input type="checkbox"/> E <input type="checkbox"/> F	<input type="checkbox"/> D <input checked="" type="checkbox"/> E

**Module category**

- Fundamental theoretical principles
- Technical/scientific specialization module
- Context module

**Lessons**

- 2 lecture periods and 1 tutorial period per week

**Brief course description of module objectives and content**

In an automation system in manufacturing technology or process automation, sensors measure non-electric values and actuators, such as drives, influence the process. The individual components are controlled by control systems and automatic controllers, connected with industrial networks, and supervised by humans.

The emphasis of this module is on the selection and determination of the individual components, bearing in mind functional aspects, with special attention to functional safety.

**Aims, content, methods**
**Learning objectives and acquired competencies**

The student will be able to :

- establish the specifications of an integrated mechatronic system, including the sensors, the actuators, and the control systems;
- master the operation of electric drives for automated processes; be able to choose a motor with its controls according to the applications;
- select and to integrate technologies of sensors according to applications;
- determine a suitable communication system for an automation task on the basis of functions and performance parameters;
- designate the evaluation criteria for the application of user interfaces;
- plan and size an Ethernet-based network;
- calculate comprehensive parameters (MTBF, MTTF, MTU...) on the basis of statistical data;
- complete a risk analysis

**Contents of module with emphasis on teaching content**

The module is divided in three courses:

**1. Drives and Sensors (ca. 35%)**

- Functionality, calculation, and operational behavior of motors
- Functionality and choice of sensors
- Drive design and regulation
- Decentralized drive systems
- Application examples

**2. Communication and Networks (ca. 30%)**

- Functionality and integration of automation components (bus systems, automation devices, communication modules, process control systems)
- Networked automation technology
- Service and monitoring systems, Human Machine Interface
- Planning and the basic principles of project planning with *Profinet* / industrial Ethernet-based networks
- Application examples

**3. Safety Engineering in Automation Technology (ca. 35%)**

- Project planning for an error-proof automation system
- Error-proof communication and programming
- Remote diagnostics, elimination of errors, and remote maintenance
- Application examples

**Teaching and learning methods**

- Lecture, presentations and discussion of theoretical topics
- Discussion of practical applications and examples from the industry
- Exercises and self-study of selected topics

**Prerequisites, previous knowledge, entrance competencies**

- Basic principles of automation technology
- Basic principles of communication technology, e.g. OSI Reference Model, Ethernet, TCP/IP etc.
- Basic principles of statistics and random variables

**Literature**

The lecturers' scripts will contain references to current literature.

**Assessment****Certification requirements for final examinations (conditions for attestation)**

None

**Written module examination**

Duration of exam : 120 minutes  
Permissible aids: Open book